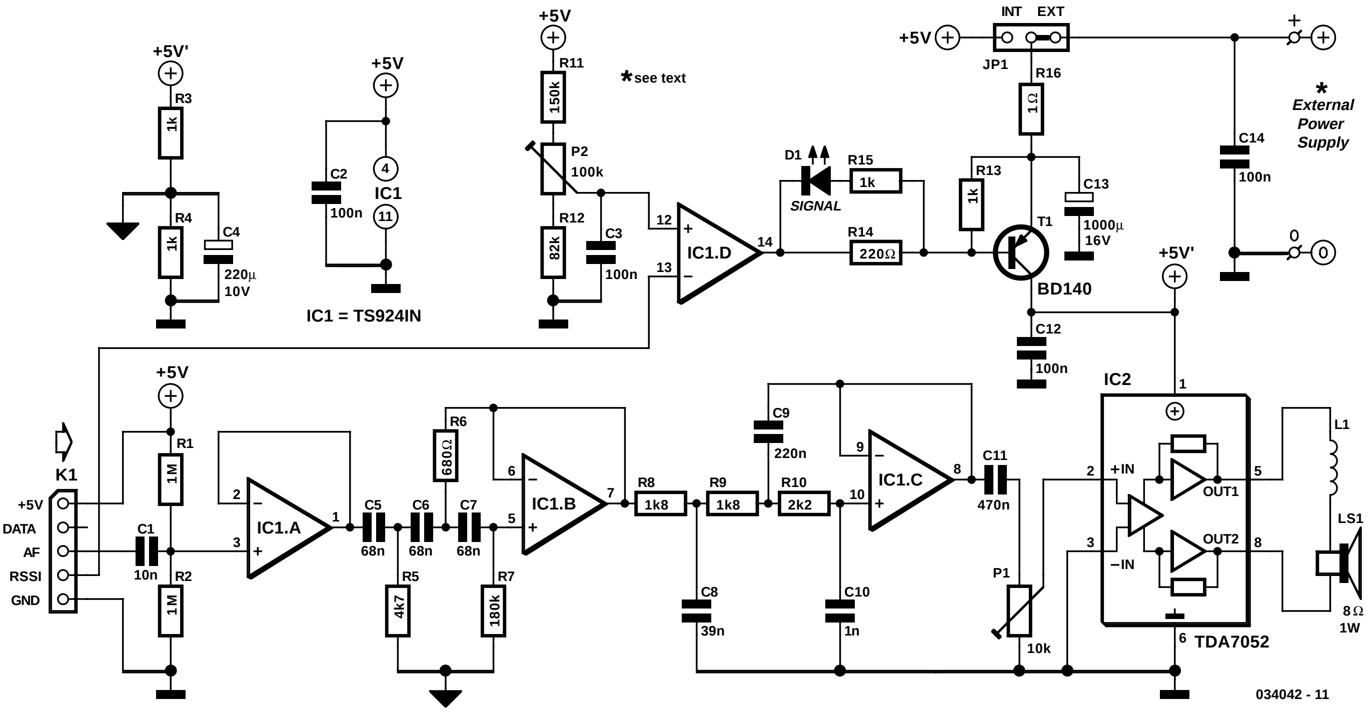
Amplifier with Squelch



T. Giesberts

This addition to the receiver part of the ‘FM Remote Control’ is mainly intended for use as a simple intercom or P.A. system. With a few changes this circuit could possibly also be used with different receiver modules. In the previously mentioned project the decoder and dual D-type flip-flop (IC2 and IC3) are not required for use with this circuit.

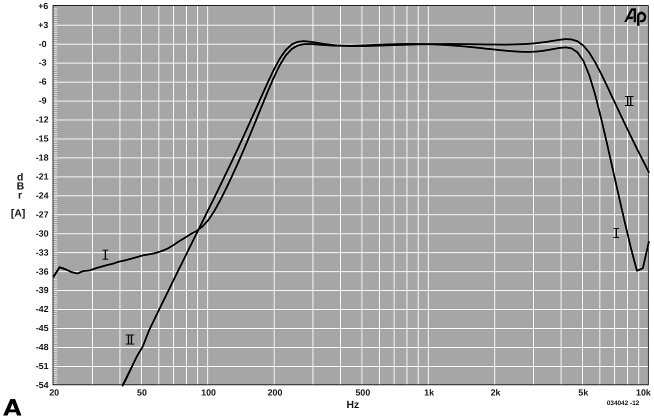
The main feature of this circuit is that the supply voltage to the power amplifier is switched on or off automatically. Implementing a mute state this way is very simple and also saves on current consumption (especially important in battery powered applications). Opamp IC1d, which is configured as a comparator, compares the signal strength of the RX5 receiver with a level set by P2. The range of P2 is a little bit larger than the voltage provided by the RSSI output of the receiver module, and are 1.23-2.74 V and 1.27-2.63 V respectively. IC1d switches T1, which then provides a supply voltage to the power amplifier. Potential divider R13/R14 makes T1 switch cleanly and the voltage across R14 is used via D1 to indicate when a signal is received.

For the power amplifier a small bridge amplifier is used, which comes in an 8-pin DIL package: the TDA7052. This is a neat little chip that requires no external components apart from a volume control (P1). It did appear that this integrated amplifier had a tendency to oscillate when long leads were used to connect the loudspeaker. Air-cored coil L1 (6 turns of 1 mm CuL wire, with an inner diameter of 10 mm) offers reasonable protection against this, but it is better still to use such a coil in each of the loudspeaker leads.

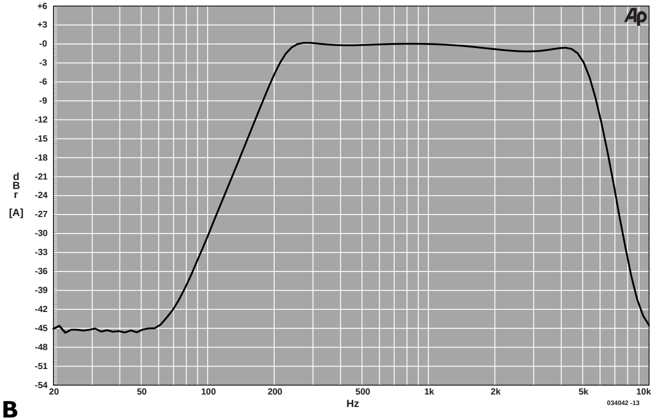
A variant of the amplifier is the TDA7052A. This has an internal DC controlled volume control, which is controlled with a voltage on pin 4 (not connected here). Although we haven’t tested this, this pin can probably be left unconnected, which means that the A-type can be used without having to make any changes.

Connector K1 in the circuit diagram corresponds to K1 in the ‘FM remote control’. Apart from the RSSI signal strength output, use is also made of the demodulated LF signal (AF output). It becomes clear that the transmitter and receiver modules of this remote control were not really designed for audio when the distortion of the signal is measured when it has gone through the transmitter and receiver. This turned out to be about 3%. The speech quality is good, due to the heavy use of filters in this circuit. IC1b is used to make a 3rd order highpass filter with a turnover frequency just above 200 Hz and round IC1c is a similar lowpass filter with a turnover frequency of about 5.5 kHz. Both filters are Chebyshev types with a ripple of only 1 dB. **Figure A** shows two graphs: I is measured with the transmitter/receiver/amplifier combination, II is just for the amplifier. The filters also reduce any noise introduced by the transmitter or receiver.

As a comparison we have also taken some measurements using a previous generation of the transmitter and receiver modules (the transmitter was a TX2-433-40-5V and the receiver an RX2-433-14-5V, both made by Radiometrix). With



A



B

optimum modulation (1.2 V at the transmitter module, 4.5 V supply voltage, compressor set for fixed gain) we measured a distortion of only 0.4%; this is quite a big difference! And with a similar measurement as in figure A-I the noise floor at low frequencies seemed to have moved from –36 dB to –45 dB. The disadvantage is that these modules only have a carrier-detect output and require some extra circuitry to change this into a 'signal strength' output.

The current consumption of this circuit when it fully drives an 8 Ω speaker is about 0.22 A. The amplifier can then deliver 400 mW into 8 Ω. The 'FM Remote Control Receiver' is not capable of delivering such a large current, which is why jumper JP1 gives a choice of using either an internal or external power supply. The supply voltage for the filters and comparator can still be derived from the receiver via K1, but if use is made of an external 5 V source then it makes sense to use that to supply the whole circuit.

Without an audio signal the current consumption is about 33 mA. When the signal strength is below the threshold the circuit goes into a mute state and the current consumption drops to just 4.5 mA.

(034042-1)